CLAIMS

What is claimed:

1. An apparatus, comprising:

a short pulse laser to remove at least one particle defect on a wafer surface.

2. The apparatus of claim 1, wherein the short pulse laser is a femtosecond laser.

3. The apparatus of claim 1, wherein the short pulse laser has a pulse period of about 50 femtoseconds (fs) to about 500 fs.

4. The apparatus of claim 1, wherein the at least one particle defect has an approximate diameter of about 1 to about 10 micrometers (μm).

5. The apparatus of claim 1, wherein the at least one particle defect has a significant portion of its volume above the wafer surface.

6. The apparatus of claim 1, wherein the short pulse laser is to exert an energy of between about 1 to about 30 microJules (uJ) per pulse.

7. A method, comprising:

focusing a short pulse laser beam onto a particle defect on a wafer surface; and

ablating the particle defect with the short pulse laser beam.

8. The method of claim 7, wherein ablating is to cause the particle defect to undergo explosive evaporation.

9. The method of claim 7, wherein ablating is to cause the thermal gradient in the particle defect to increase rapidly causing substantial internal stress within the particle defect causing explosive fracture.

10. The method of claim 7, wherein focusing is to direct the laser beam so that a focal point of the laser beam contacts the particle defect at a low incidence angle.

11. The method of claim 7, wherein focusing is to direct the laser beam so that a focal point of the laser beam contacts the particle defect at an angle between about 5° to about 30° from the wafer surface.

12. The method of claim 7, wherein focusing is to position a focal point of the laser beam to be above the wafer surface at a distance approximately equivalent to the approximate radius of the particle defect.

13. The method of claim 7, wherein focusing is to position a focal point of the laser beam to be between about 1um to about 10um above the wafer surface.

14. The method of claim 7, wherein the particle defect has an approximate diameter of between about 1um to about 10um.

15. The method of claim 7, wherein the particle defect has a significant portion of its volume above the wafer surface.

16. The method of claim 7, further comprising:

scanning the surface of the wafer to gather data about the location and physical properties of the particle defects; and

aligning the laser beam according to the data.

17. A system, comprising:

a particle defect detector to detect particle defects on a wafer surface; and

a particle defect ablator including a short pulse laser to ablate the particle defects.

18. The system of claim 17, wherein the particle defect detector includes a low energy laser to detect the particle defects above the wafer surface and produce signals containing data about the particle defects physical properties and location.

19. The system of claim 17, wherein the particle defect detector includes a processing device to receive the signals and utilize the data.

20. The system of claim 17, wherein the processing device is to utilize the data to compute a coordinate map of the particle defects, and wherein the particle defect ablator is to utilize the coordinate map to align the short pulse laser to the particle defects on the

wafer surface.

21. The system of 17, wherein the processing device is to utilize the data to compute a particle-properties database containing physical properties about the particle defect and wherein the particle defect ablator is to utilize the particle-properties database to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

22. The system of claim 17, wherein the particle defect ablator includes a femtosecond laser.

23. The system of claim 17, wherein the particle defect ablator is to provide a pulsed laser beam to the particle defect, the pulsed laser beam having an approximate time frequency between about 50 fs to about 500 fs.

24. The system of claim 17, wherein the particle defect ablator is to provide a pulsed laser beam to the particle defect, the pulsed laser beam having an energy between about 1uJ to about 30uJ.

25. A method, comprising:

scanning the surface of a wafer to gather data about location and physical properties of particle defects on the wafer surface; and

aligning and focusing a short pulse laser beam on particle defects to ablate the particle defects, the aligning and focusing being performed based on the data.

26. The method of claim 17, wherein aligning and focusing is done automatically.

27. The method of claim 17, further comprising:

computing a coordinate map of particle defects according to the data; and

utilizing the coordinate map to position a focal point of a laser beam upon the particle defects.

28. The method of claim 17, further comprising:

computing a database of physical properties of the particle defects according to the data; and

utilizing the database of physical properties to control power, time frequency pulsing, or other electronic functions of the short pulse laser.

29. The method of claim 17, further comprising:

computing a coordinate map of the location of particle defects based on the data;

computing a database of physical properties of the particles defects based on the data; and

storing the coordinate map and database in memory to be utilized subsequently to ablate the particles defects.